Announcements

- 1st EXAM on *Tuesday, Feb. 14!*
- Homework for tomorrow…

  Ch. 28: CQ 3, Probs. 12, 34, & 37

  26.40: a. $E = KQ/(r^2-L^2/4)$ b. Lim_{$r>>L$} E ->KQ/r^2 c. E = 9.8 x 10^4 N/C
  CQ4: a. same b. same
  28.2: 2.7 x 10^6 m/s
  28.4: 2.5 x 10^4 m/s

- Office hours…

  MW 10-11 am
  TR 9-10 am
  F 12-1 pm

- Tutorial Learning Center (TLC) hours:

  MTWR 8-6 pm
  F 8-11 am, 2-5 pm
  Su 1-5 pm

Chapter 28

The Electric Potential

(*The Electric Potential*)

Last time…

Electric Potential Energy between 2 pt. charges…

$$U_{elec} = \frac{K q_1 q_2}{r}$$

i.e. 28.4: Launching an electron

Three electrons are spaced 1.0 mm apart along a vertical line. The outer two electrons are fixed in position.

a. Is the center electron at a point of stable or unstable equilibrium?

b. If the center electron is displaced horizontally by a small distance, what will its speed be when it is very far away?

28.4: The Electric Potential

$\vec{F}_{on\ q}$

Force on *q*, due to some *source charge*

$\vec{E} \equiv \dfrac{\vec{F}_{on\ q}}{q}$

Electric field, due to some *source charge*

$U_{q\ +\ sources}$

Potential energy between *q* & *source*

?

Potential energy per *charge?*

28.4: The Electric Potential

$\vec{F}_{on\ q}$ → $\vec{E} \equiv \dfrac{\vec{F}_{on\ q}}{q}$

Force on *q*, due to some *source charge*

Electric field, due to some *source charge*

$U_{q\ +\ sources}$ → $V \equiv \dfrac{U_{q\ +\ sources}}{q}$

Potential energy between *q* & *source*

Potential of *source charge*

The Electric Potential

$$V \equiv \frac{U_{q\,+\,sources}}{q} \quad \text{or} \quad U_{q\,+\,source} = qV$$

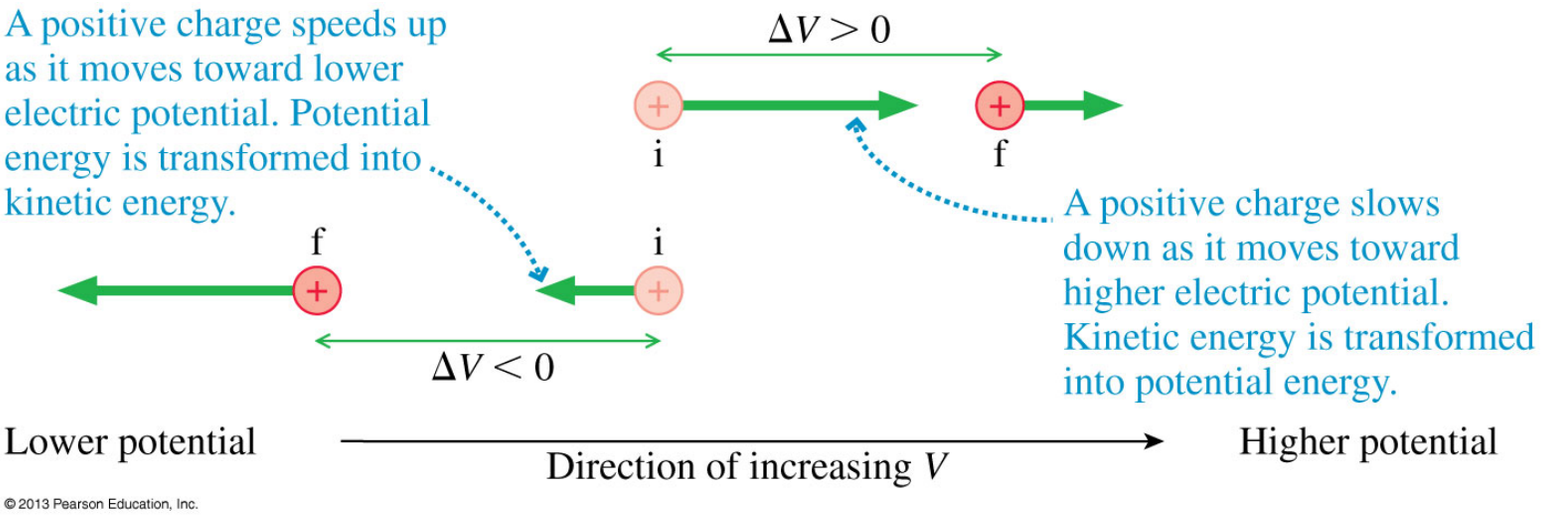
SI Units:

$$1\ Volt = 1V \equiv 1\frac{J}{C}$$

Notice:

- The *electric potential*, like the *E*-field, is a property of *source* charge(s).

Using the Electric Potential…



For +q moving to the *right*:

- *V increases*, *U increases*, K *decreases*

For +q moving to the *left*:

- *V decreases*, *U decreases*, K *increases*

- What about for a –q?

i.e. 28.6:
Moving through a potential difference

A proton with a speed of 2.0×10^5 m/s enters a region of space in which source charges have created an electric potential.

What is the proton's speed after it moves through a potential difference of 100V?

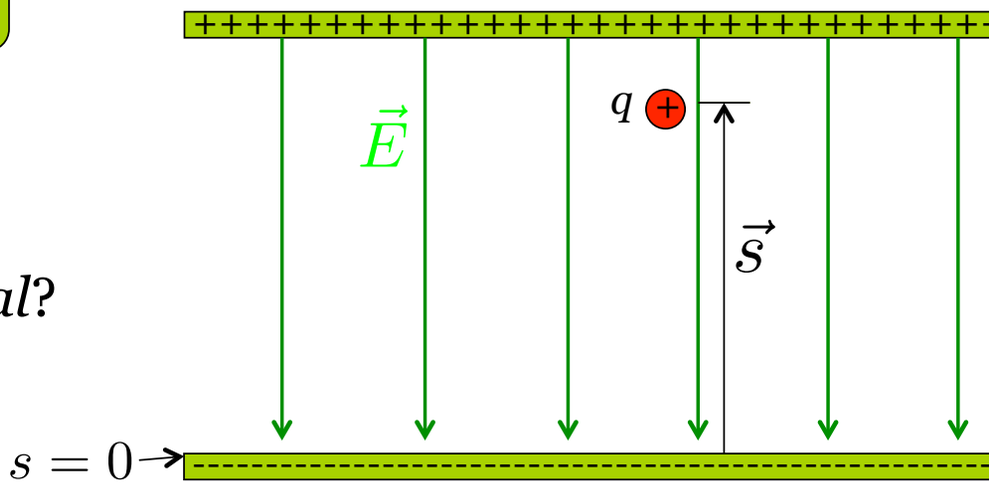
What will be the final speed if the proton is replaced by an electron?

28.5: The Electric Potential Inside a Parallel-Plate Capacitor

The *Electric Potential Energy* of a charge q in the *uniform E*-field of a parallel-plate capacitor is…

$$U_{elec} = qEs$$

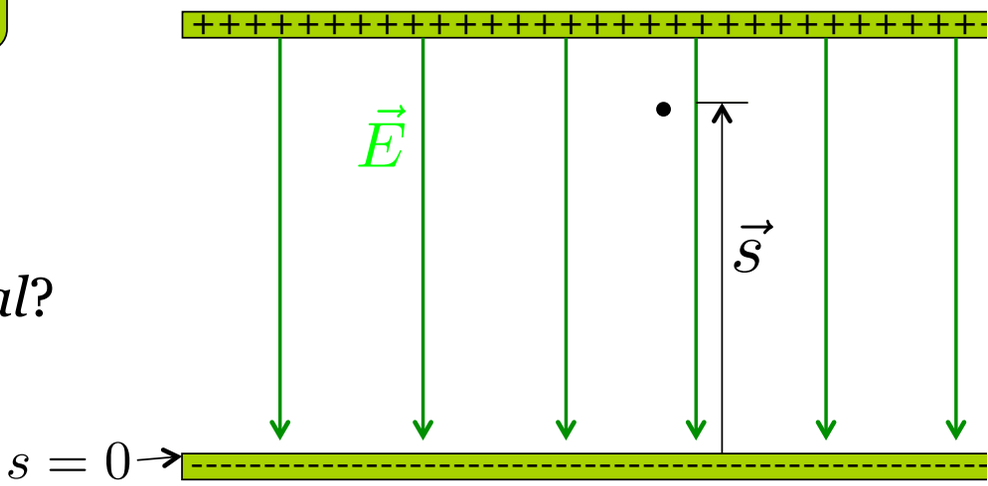
- So, what's the *Electric Potential*?



28.5: The Electric Potential inside a Parallel-Plate Capacitor

The *Electric Potential Energy* of a charge q in the *uniform E-*field of a parallel-plate capacitor is…

$$U_{elec} = qEs$$



So, what's the *Electric Potential*?

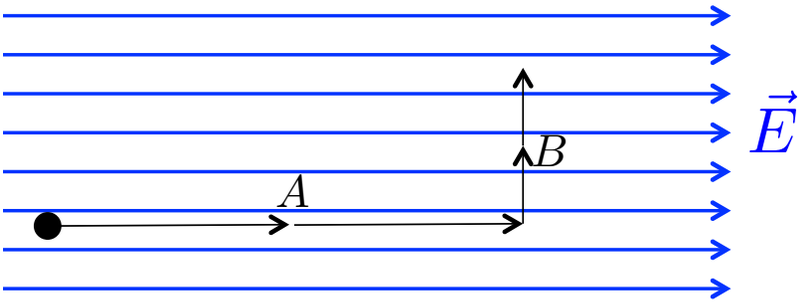
$$V = Es$$

where s is the distance from the *negative electrode*.

Quiz Question 1

A *negative* charge is moving through an *electric field* along a path consisting of 2 legs (*A* & *B*). Let *W* represent the work done by the field, and ΔV the change in potential.

Which of the following statements is/are true:



I. $W_A > 0$

II. $W_B > 0$

III. $\Delta V_A < 0$

IV. $\Delta V_A > 0$

1. I only
2. I and II
3. III only
4. I and III
5. II and IV